

Argonne National Laboratory-West Status

*Presented at the National Spent Nuclear
Fuel Strategy Meeting*

*Robert W. Benedict
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Electrometallurgical Treatment of Sodium Bonded SNF at ANL-W

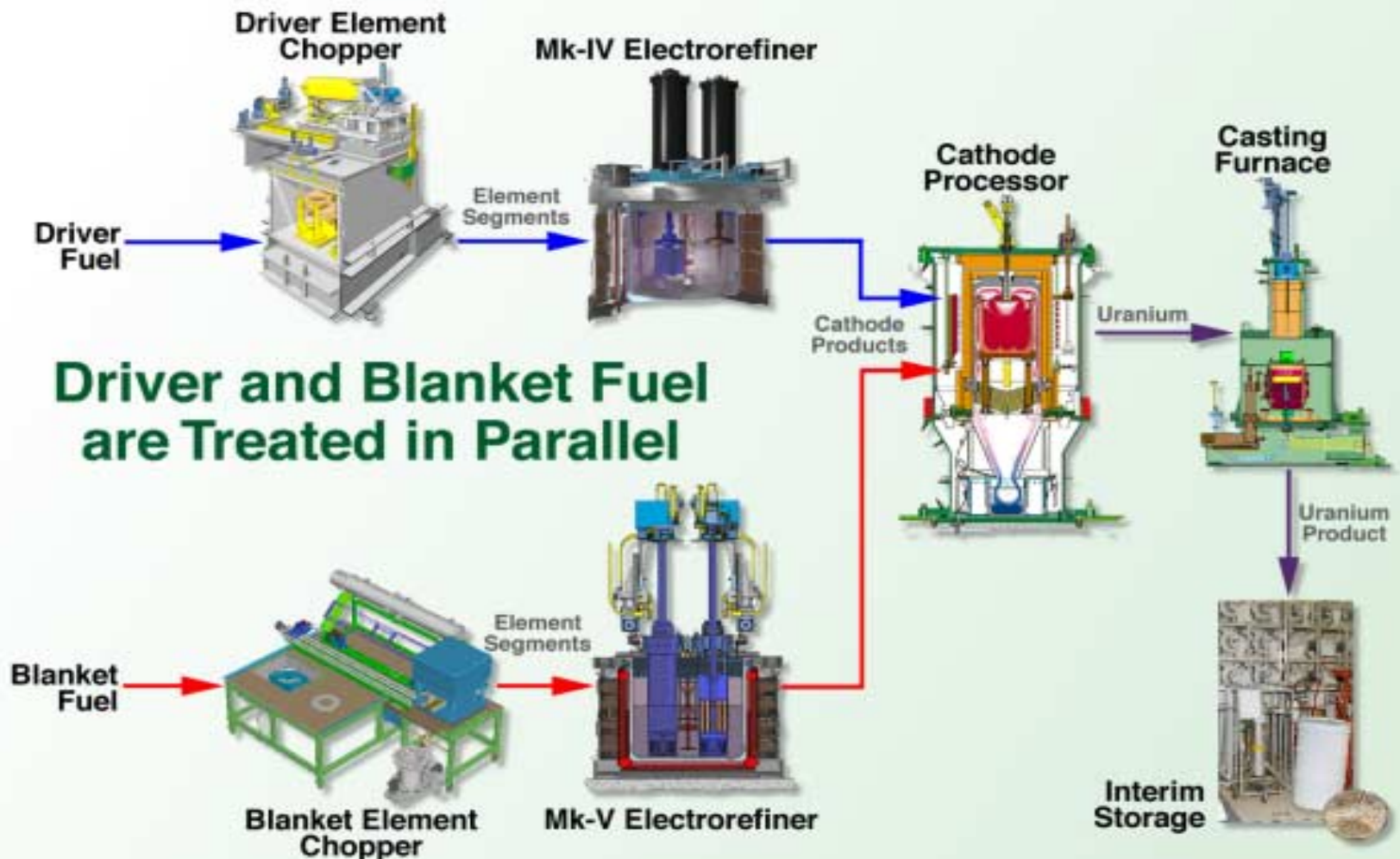
Na-Bonded SNF Inventory to treat

<u>Fuel</u>	<u>ANL-W</u>	<u>INTEC</u>	<u>FFTF</u>	<u>Total</u>
HEU Driver	700	2,000	250	2,950
DU Blankets	21,800	-	-	21,800
Total	22,500	2,000	250	24,750

Electrometallurgical Treatment of Sodium Bonded SNF at ANL-W

- FY-2001: Treatment of EBR-II Blanket fuel resulted in 383 kgHM treated, goal is 600 kgHM.
- Treatment rate will ramp to 5 MTHM/yr by FY2007.
- Treatment goal for all ROD-specified fuel is FY2010.

Spent Fuel Treatment Program Process Flow

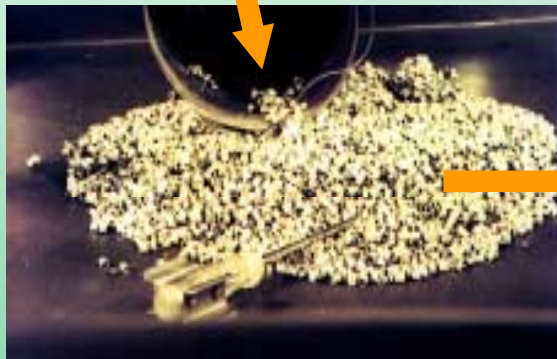


Metal Waste Process



**FCF
Electrorefiners**

Cladding Hulls



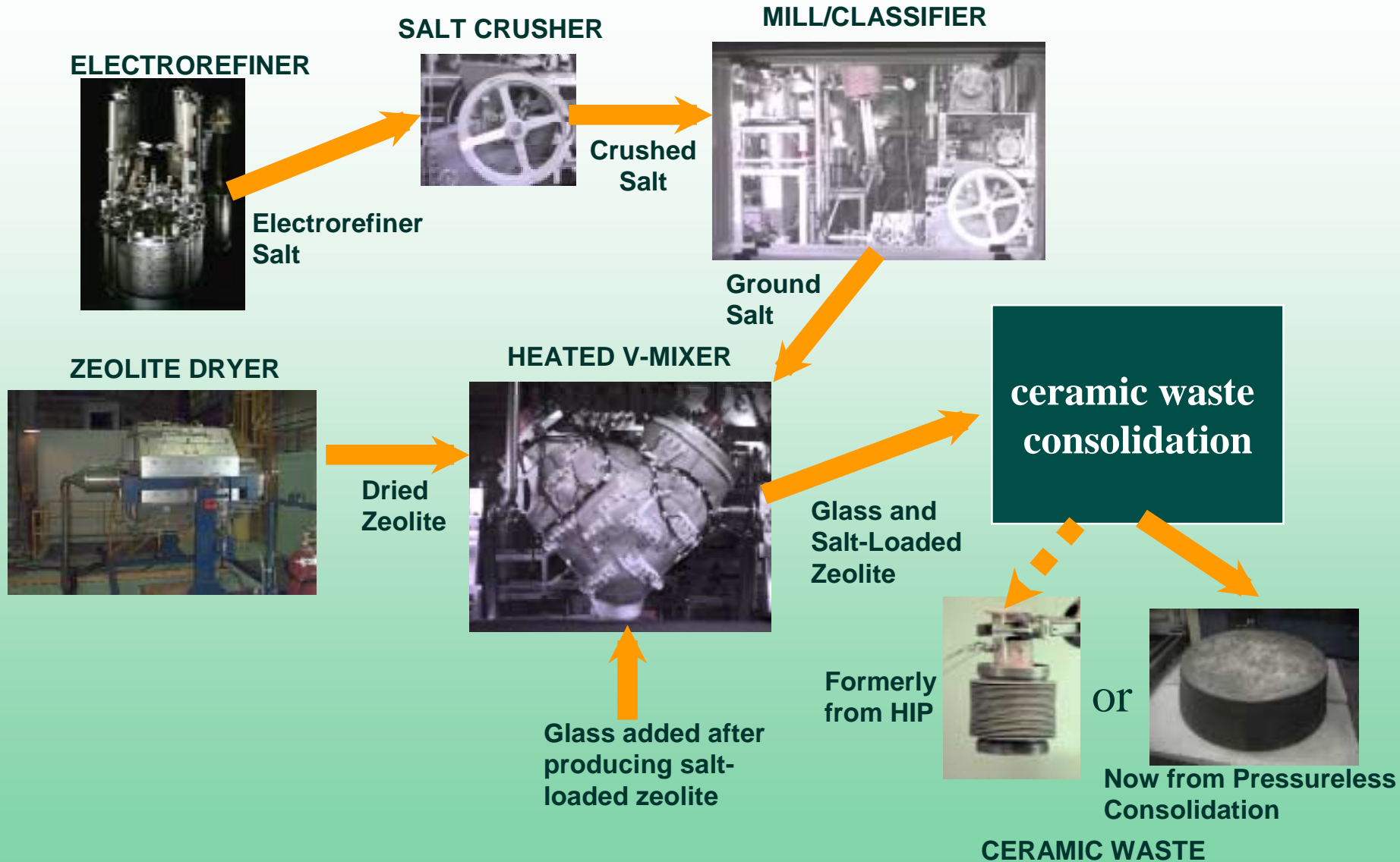
Metal Waste Furnace

Zirconium



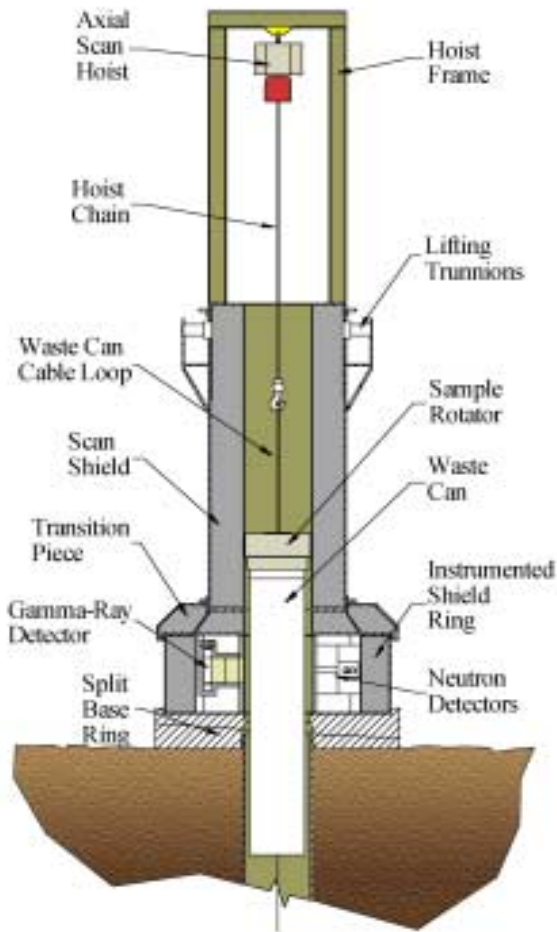
Metal Waste Form

Ceramic Waste Process



Spent Fuel Inventory Verification

DOE Office of Safeguards and Security has issued guidelines stating that the fissile mass in spent fuel inventories must be determined by measurement or other validated means.



Shielded Measurement System

ANL-W will utilize the Shielded Measurement System (SMS) to verify fissile mass of representative fuel prior to Electrometallurgical Treatment:

The SMS provides a platform for nondestructive measurements to verify the computational predictions of spent fuel fissile mass:

- Interfaces with hot cells and underground dry storage areas at ANL-West
- Shielded detector enclosure accommodates variety of detection instruments (gross gamma, gross neutron, gamma spectroscopy, neutron coincidence)
- System fabrication and shield verification complete
- Fuel measurements begin July, 2001

Sodium Treatment- Process Description

- **Treatment Process**
 - $\text{Na} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \frac{1}{2} \text{H}_2$
- **Product and Process specification**
 - >70 weight percent NaOH

Process Specification
- **Process control- NaOH concentration**
 - controlled on boiling point of 73 weight percent NaOH
- **Sodium injected into NaOH**
 - sodium injection rate constant
- **Smooth Running Process once Process and Product Specification Defined**



Sodium Treatment -Process Description (cont'd)

■ Product

- Product loaded into 71 gal drums
- Solid at $<140^{\circ}\text{F}$
- No longer regulated, Low Level Waste

■ Disposal

- US Environmental Protection Agency compliant, land disposable
- Idaho National Engineering and Environmental Laboratory (INEEL) Radioactive Waste Management Complex (RWMC)
 - Disposal assumes life of 125 years,
 - Dissolution of all NaOH in the aquifer,
 - Modeling indicated insignificant change in aquifer pH (0.2 pH).



Sodium Inventory Treated

Major Milestones

	<u>Goal</u>	<u>Completed</u>
■ Complete Primary Sodium Processing	3/2001	2/17/01
■ Complete Processing Fermi Sodium	4/2001	3/5/01
■ ANL-W Sodium Processed		
— Fermi-1 Primary Sodium	77,000 gal	
— EBR-II Secondary Sodium	15,000 gal	
— EBR-II Primary Sodium	<u>87,000 gal</u>	
— Total	179,000 gal	
■ Treated Sodium Product		
— 3,346 Drums		